
# PRELIMINARY EVALUATION OF LOW NOISE SiGe AMPLIFIERS AT CRYOGENIC TEMPERATURES

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GLENN RESEARCH CENTER at Lewis Field

## OBJECTIVE

To evaluate performance of high frequency, low noise amplifiers based on silicon germanium technology for cryogenic space applications

## DEVICES

- Texas Instruments THS4302
- Maxim 2644 Evaluation Kit

## TEST PARAMETER

- Gain versus frequency at various temperatures
- Cold-restart capability at cryogenic temperatures

## Manufacturer's Device Specifications

| Manufacturer | Texas Instruments | MAXIM |
|---|---|---|
| Device | THS 4302 | 2644 Evaluation Kit |
| Gain (dB) | 14 | 16 |
| Bandwidth (GHz) | 2.4 | 2.4 |
| Supply Voltage (V) | +3 or +5 | 2.7 to 5.5 |
| Power Dissipation (W) | < 3.16 | 0.245 |
| Temperature Rating (°C) | -40 to +85 | -40 to +85 |

# DEVICE UNDER TEST IN CRYOGENIC CHAMBER

GRC
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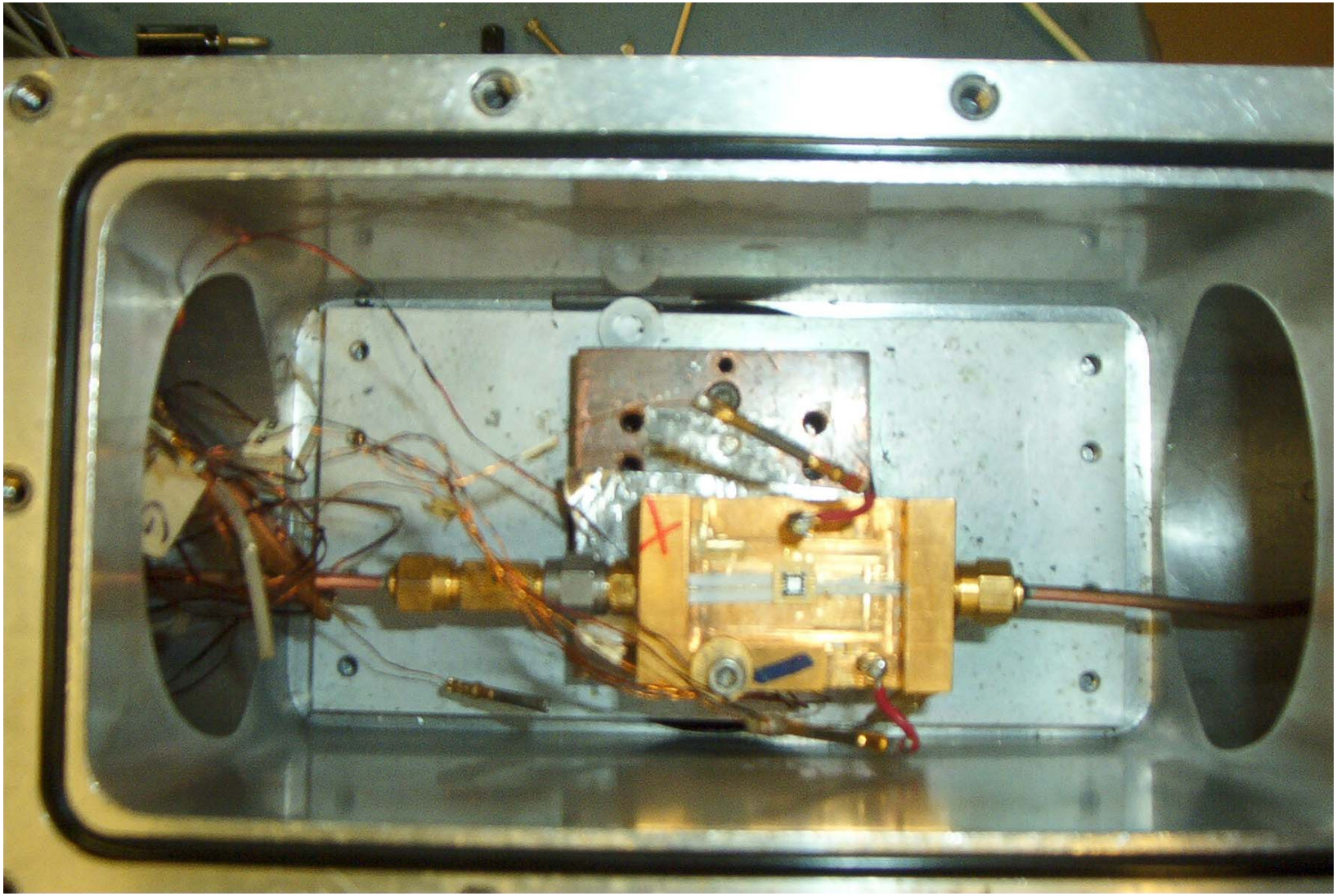
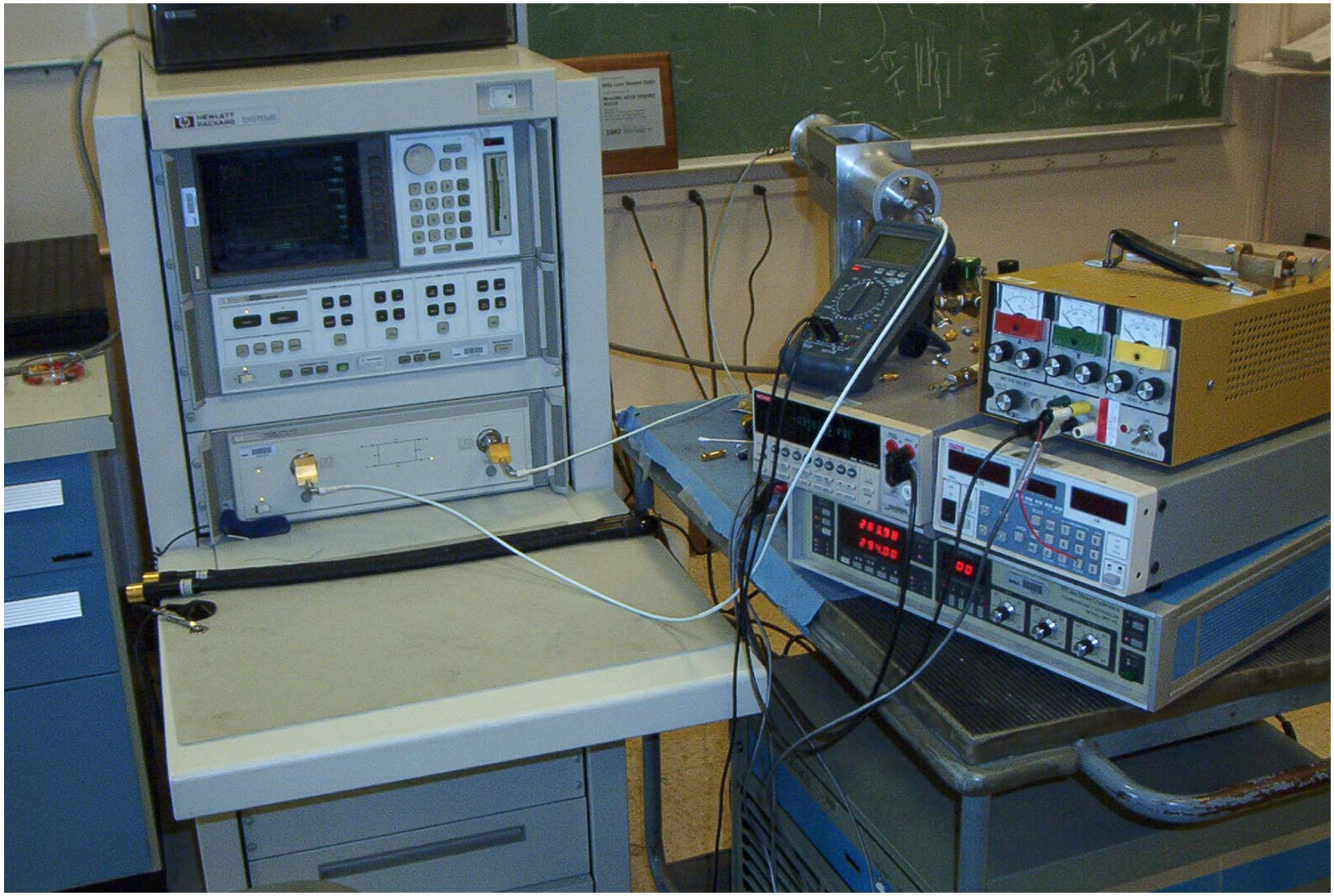
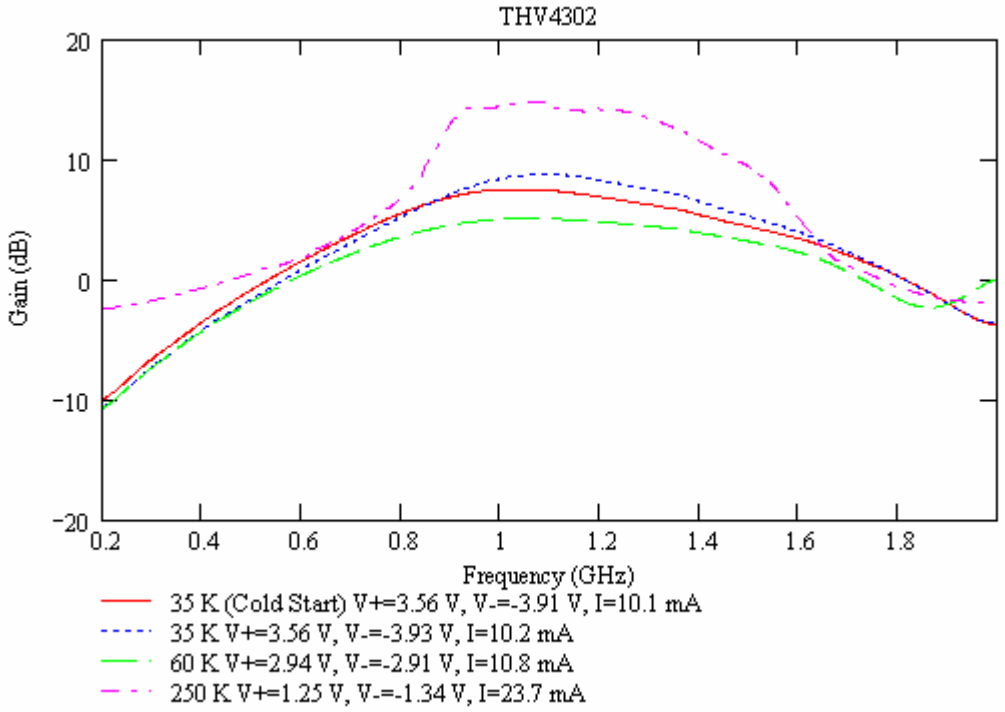
at Lewis Field



# INSTRUMENTATION SETUP



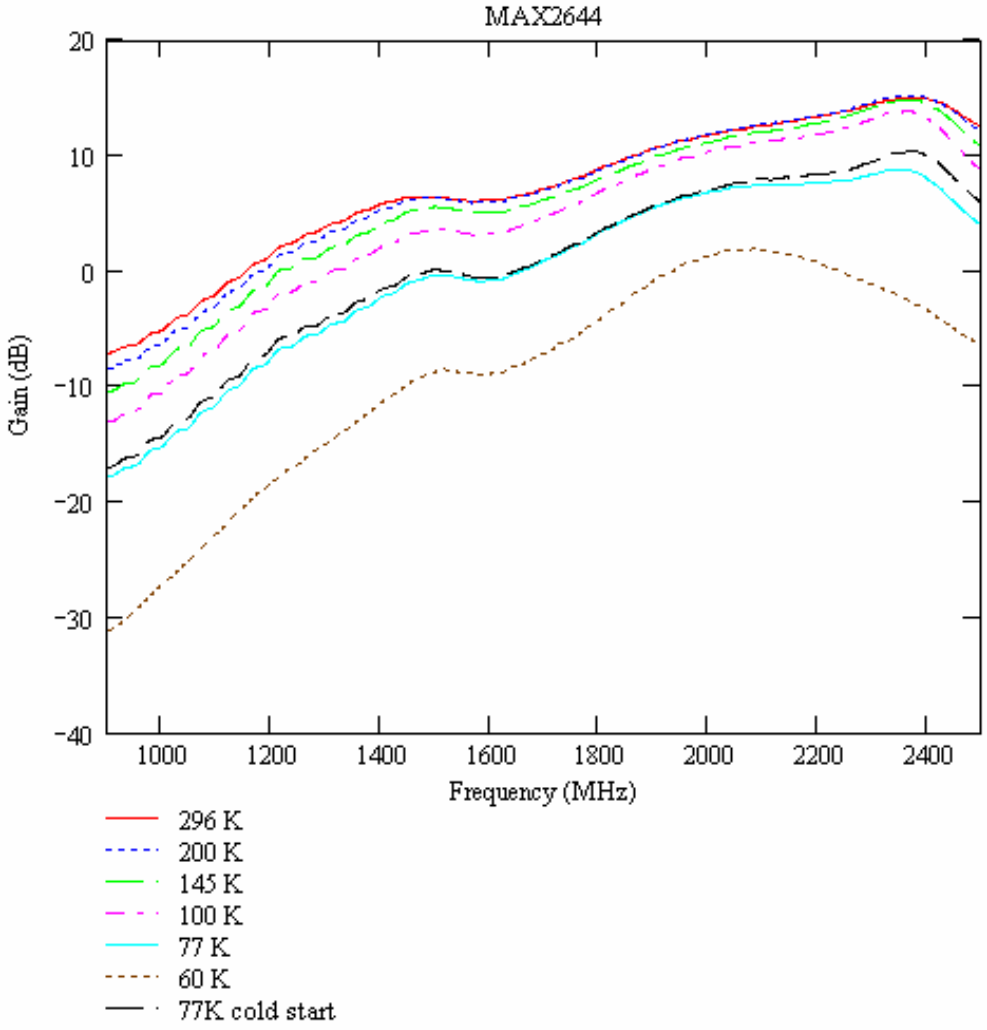
# TEXAS INSTRUMENTS THS4302




| Temp (K) | V+ (V) | V- (V) | Ic (mA) |
|---|---|---|---|
| 250 | 1.25 | -1.34 | 23.7 |
| 60 | 2.94 | -2.91 | 10.8 |
| 35 | 3.56 | -3.93 | 10.2 |
| 35 | 3.56 | -3.91 | 10.1 (Cold Start) |

**Loss includes two SMA launchers**
**Bias adjusted to maximum gain at midband**

# MAXIM 2644 EVALUATION KIT




| Temp (K) | Ic (mA) | Vc (V) | Comment |
|---|---|---|---|
| 296 | 7.2 | 3.0 | $P_{in}$=-13 dBm |
| 200 | 5.0 | 3.0 | |
| 145 | 3.8 | 3.0 | |
| 100 | 2.7 | 3.0 | |
| 77 | 1.5 | 3.0 | |
| 60 | 0.6 | 3.0 | |
| 77 | 1.4 | 5.0 | Cold Start |

Eval Kit matched to 50 Ohms at 2.45 GHz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## REMARKS

### Texas Instruments THS4302

- Device functioned with temperature down to 35 K
- Bias was adjusted to maximize gain at midband
- Successful cold-restart at 35 K after 7 min. power off

### MAXIM 2644 Evaluation Kit

- Device functioned with temperature down to 60 K
- Gain dropped off significantly below 60 K (Bias may need to be adjusted)
- Successful cold-restart at 60 K after 7 min. power off